Egyptian Herbal Monograph

Volume 1

Traditional wild medicinal plants

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***Cyperus rotundus* L.** السعد

1. Names & Synonyms (1, 2)

***Cyperus rotundus* L.**

Family: Cyperaceae.

Arabic: Se'ed سعد

English: Nut grass, nutsedge, purple nutsedge (North Africa, IUCN).

Two varieties occur in Egypt:

a. var**. *rotundus***

Syns. *Cyperus tuberosus* Rottb., *C. hexastachyos* Rottb., *C. comosus* Sibth. & Sm., *C. subcapitatus* C. B. Clarke.

b. var. ***fenzelianus***

Syns. *Cyperus fenzelianus* Steud., *C. ochreoides* Steud., *C. pallescens* Boiss.

2. Geographical distribution (2)

a. var**. *rotundus*:** Common in nearly all the phytogeographical regions of the country.
b. var. ***fenzelianus*:** The Nile region, the oases of the western desert as well as the Mediterranean region and all the deserts of the country.

3. Parts used for medicinal purposes

Rhizomes, tubers, leaves and the herb (2-4).

4. Major chemical constituents

- **Volatile oil:** The chemical constituents of the volatile oil obtained from *C. rotundus* rhizomes growing in Bahtim, Egypt includes two monoterpenes, eight oxygenated monoterpenes, eight sesquiterpenes, seventeen oxygenated sesquiterpenes, and two hydrocarbons. The oil contained a high percentage of oxygenated sesquiterpenes followed in decreasing order by oxygenated monoterpenes then monoterpenes, sesquiterpenes and hydrocarbons. Major compounds are humulene

epoxide, caryophyllene oxide, lα,7α,10α gaia- 4,11(13)-dien-3-one, β-pinene, α-pinene, *trans*-(-) pinocarveol and oxo-α-ylangene (5).

Volatile oil of *C. rotundus* tubers collected from Giza, Egypt constituted mainly of oxo-α-ylangene, α-cyperone, *trans*-pinocarveol, cyperene, 2(H)-Naphthalenone, 2(H)-naphthalenone, 4a,5,6,7,8,8a hexahydro-7-isopropyl,4a β, 8a β-dimethyl and aristolone (6).

Among the chemical composition of volatile oil of *C. rotundus* parts from around the world are: α-cyperone, cyperene, cyperotundone and β-selinene as major compounds, along with other constituents such as, α-copaene, valerenal, caryophyllene oxide, patchoulenyl acetate and sugeonyl acetate. In addition, α- and β-pinenes, limonene and 1,8-cineole are the minor components. The oil chemical composition changes considerably according to its geographical origin (7- 11).

- **Flavonoids:**

The main flavonoids are: apigenin, luteolin, tricin and quercetin and their glycosides, myricetin, kaempferol, rutin, isorhamnetin, rhamnetin3-(4-rhamnosylrhamnoside), biflavones (amentoflavone, ginkgetin, isoginkgetin and sciadopitysin). The flavonol derivative; cyperaflavoside (myricetin 3,3',5'-trimethyl ether 7-*O*-β-D-glucopyranoside) and five flavonoids (vitexin, orientin, cinaroside, quercetin 3-*O*-β-D-glucopyranoside, and myrcetin 3-*O*-β-D-glucopyranoside) were reported (12-16).

- **Nitrogenous constituents**

The main compounds are: rotundine A and B, octopamine, 6,7-dihydro-2, 3-dimethyl-5-cyclopentapyrazine, adenosine, uridine and tryptophan α-D-fructofuranoside (17).

- **Others:**

Tannins(Afzelechin, catechin), phenolic acids (e.g. salicylic, protocatechuic, caffeic, *p*-coumaric and ferulic acids), sterols, saponins, coumarins, chromones (visnagin, khellin, ammiol and Khellol-β-Dglucopyranoside), steroids (steroidal glycoside, sitosteryl-(6'-hentriacontanoyl)-β-D-galactopyranoside), phenylpropanoids (isoaragoside, chionoside A and helioside C) and iridoid glycosides (Rotunduside A & B), as well as quinones (cyperaquinones, scabiquinones, berviquinones and alkenylhdroxy of quinones), carbohydrates, starch, protein, amino acids and fatty acids (linolenic, linoliec, oleic, myristic and stearic acids) were reported. The molasses extracted from the tubers of *C. rotundus* contains D- glucose, D- fructose and non-reducing sugars (9, 17).

5. Traditional medicinal uses

A. Stops body hair growth (3).

B. Aphrodisiac, anthelmintic, diuretic, carminative, tonic and stimulant. Also, it is used as a remedy for renal colic and dysentery (18).

C. Aromatic, stomachic, sedative and as analgesic (3).

***C. rotundus* is a traditional medicinal plant for use in the specified indications exclusively based upon long-standing use.**

6. Herbal preparations correlated to traditional medicinal uses

1. The herb is boiled with water till it becomes thick, then rub the hairy body areas (3).
2. **Anthelmintic** (4):
   - **2.1. Tablet:** Grind the leaves of *C. rotundus* (or the herb of *C. rotundus*) into a paste and make it in tablets.
   - **2.2. Paste:** The rhizome is made into a paste.
3. Rhizome, in the form of ellipsoid tubers (3).

7. Posology and method of administration correlated to traditional medicinal uses

Preparation 1

Indication A

Rub the preparation into the body hairy areas to stop hair growth (3).

Method of administration: Topical use.

Preparation 2

Indication: Anthelmintic (4):

2.1. Take one tablet orally, thrice a day for one or two days.

2.2. 10 - 20g of the paste is eaten 3 times a day, 2-3 days. Children dose is usually halved.

Method of administration: Oral use.

8. Contraindications

Hypersensitivity to active substances and to other plants of the same family.

9. Special warnings and precautions for use (19, 20)

-If the symptoms worsen during the use of the medicinal product, a doctor or a pharmacist should be consulted.

-Bleeding disorders: *C. rotundus* might slow blood clotting. This might increase the risk of bruising or bleeding in people with bleeding disorders.

-Slow heart rate (bradycardia): *C. rotundus* might slow down the heartbeat. This could be a problem in people who already have a slow heart rate.

-Diabetes: *C. rotundus* might lower blood sugar levels. People with diabetes should monitor their blood glucose levels regularly.

-Gastrointestinal tract blockage: *C. rotundus* might cause "congestion" in the intestines. This might cause problems in people who have a blockage in their intestines.

-Lung conditions: *C. rotundus* might increase fluid secretions in the lung. There is a concern that this could worsen lung conditions such as asthma or emphysema.

-Surgery: *C. rotundus* might lower blood sugar or slow blood clotting. Stop taking *C. rotundus* at least 2 weeks before a scheduled surgery.

10. Interactions with other medicinal products and other forms of interaction (20)

- **Cholinergic drugs:** Various medications used for glaucoma and other conditions.
- **Drying medications (anticholinergic drugs):** *C. roduntus* might decrease the effects of drying medications including atropine, scopolamine and some medications used for allergies (antihistamines) and depression (antidepressants).
- **Medications for Alzheimer's disease:** *C. rotundus* might increase the effects of Alzheimer's medications, e.g. Acetylcholinesterase (AChE) inhibitors.
- **Antidiabetic medications:** *C. rotundus* might decrease blood sugar; monitor your blood sugar regularly.
- **Anticoagulant/Antiplatelet drugs:** Taking *C. rotundus* along with medications that slow clotting e.g. warfarin and aspirin, might increase the chances of bruising and bleeding.

11. Fertility, pregnancy and lactation

- Safety during pregnancy and lactation has not been established. In the absence of sufficient data, the use during pregnancy and lactation is not recommended.
- No fertility data available.

12. Effects on ability to drive and use machines

No studies on the effect on the ability to drive and use machines have been performed.

13. Undesirable effects

- None known.
- If adverse reactions occur, a doctor or a pharmacist should be consulted.

14. Overdose

No case of overdose has been reported.

15. Relevant biological activities

- In an open-label pilot study, the author prospectively evaluated the efficacy of *C. rotundus* essential oil, compared with the Alexandrite laser (GentleLase; Candela Laser Corp, Wayland, Massachusetts) and saline, for reducing unwanted axillary hair. Eligible participants (n = 65) with unwanted axillary hair were assigned randomly to 1 of 3 study groups: topical *C. rotundus* oil (group 1), saline (group 2), and Alexandrite laser (group 3). Sixty patients completed the entire study. Three methods were used to evaluate the results: hair counts, observations of independent professionals and patient self-assessments. Overall results did not differ significantly between *C. rotundus* oil and the Alexandrite laser (p>0.05). However, statistically significant differences were noted with respect to decreased growth of white hair (p>0.05), favoring the oil. This finding was evident by all 3 methods of assessment. No side effects were detected. *C. rotundus* essential oil is as effective as the Alexandrite laser for decreasing the growth of axillary hair (both dark and white) (21).
- The efficacy and safety of application of Egyptian *C. rotundus* essential oil in comparison to 0.9% saline on androgenic hair was evaluated. Ninety one female patients with Androgenic hair (hirsutism and axillary hair) completed the study. They were randomly assigned to two groups: group I (active group) (n=47) and group II (control group) (n=44). Patients used topical *C. rotundus* essential oil for six months and were evaluated on the 6th month. The topical oil was significantly more effective (p<0.05) than the placebo without side effects. This result was proven by three assessment methods; difference in hair count, independent observer assessment and patients' self-assessment. The topical Egyptian *C. rotundus* essential oil is an effective method in treating moderate degrees of hirsutism and axillary hair without affecting serum testosterone (22).
- The essential oil of the *C. rotundus* tubers had antibacterial activity against several foodborne Pathogens. The antibacterial effects of essential oil were greater against Gram-positive bacteria as compared to Gram-negative bacteria, and the antibacterial effects were significantly influenced by incubation time and concentration. These results may provide biological evidence for the practical

application of the *C. rotundus* rhizomes essential oil in food and pharmaceutical industries (8).

- The antimicrobial activity of the essential oil and its fractions from the *C. rotundus* tubers were evaluated using the disc diffusion method against six foodborne pathogens. The essential oil and its fractions exhibited notable antibacterial activity against all the bacteria species tested. The Gram (+) bacteria was more sensitive than Gram (-). *Staphylococcus aureus* was the most sensitive bacterium, *Salmonella* was the most inhibited Gram (-) bacterium while *Eschirichia coli* was the most resistant strain at the same essential oil concentration. . *C. rotundus* essential oils can be used instead of antibiotic (10).
- The antibacterial activity of *C. rotundus* oil was studied for various microorganisms *(Staphylococcus aureus, Klebsiella pneumoniae, Proteus vulgaris, Streptococcus pyogenes, Eschirichia coli and Pseudomonas aeruginosa)* using inhibition zone method (Aromatogram). The oil of *C. rotundus* showed a remarkable activity against Gram-positive bacteria, less antibacterial activity was found against Gram–negative bacteria and no activity was observed with the oil against *Pseudomonas aeruginosa* and *Proteus vulgaris* (23).
- The antibacterial properties of *C. rotundus* root extracts (petroleum ether, acetone, methanol and water) was investigated against three Gram-positive and two Gram-negative bacteria causing respiratory tract infections. Results showed that methanol extract was the most active as comparison to other extract. The maximum inhibition was noted against *H. influenzae* followed by *S. pyogenes*, *P. aeruginosa* and *S. pneumoniae* and the minimum activity was recorded against *S. aureus* (15.3±0.05mm) (24).
- The methanol extract of *C. rotundus* rhizome, given orally at the doses of 250 and 500mg/kg b.w., showed significant antidiarrhoeal activity in castor oil induced diarrhoea in mice. Among the fractions, tested at 250mg/kg, the petroleum ether fraction and residual methanol fraction were found to retain the activity, the latter being more active as compared to the control. The ethyl acetate fraction did not show any antidiarrhoeal activity (25).
- An aqueous extract of tubers of *C. rotundus* (ACR) was tested for its antidiarrhoeal and antispasmodic activity. Antidiarrhoeal effect of ACR was evaluated in castor oil induced diarrhea in mice and antispasmodic effect was evaluated by charcoal meal test in mice at a dose of 125, 250, 500mg/kg. The % inhibition of diarrhoea was 30.36%, 37.90%, 45.45% and 92.45% for ACR 125, 250, 500mg/kg orally and loperamide 2mg/kg dose orally respectively. ACR 125, 250, 500mg/kg orally and atropine sulphate 2mg/kg dose orally produced 24.35%, 31.48%, 36.75% and 55.94% inhibition of intestinal transit respectively (26).
- Study the biflavone constituents in *C. rotundus* L., investigation of the effect and mechanism of amentoflavone on inhibition of uterine tumors was carried out. Four

biflavone constituents were isolated and obtained. . Amentoflavone could markedly reduce the uterine coefficient in model rats, lower serum estrogen levels in rats with uterine fibroids, improve the pathological conditions of uterine tissues. It concludes that amentoflavone has a significant inhibitory effect on uterine tumors in rats. Its mechanism may be by elevating Bax protein expression, down-regulating Bcl-2 expression, forming homodimers Bax/Bax, and reducing plasma estradiol and progesterone to promote apoptosis of uterine fibroid cells (14).

- Analgesic activity of *C. rotundus* essential oil was evaluated. Swiss albino rats were injected with 0.05 ml of 2.5% formalin in the sub plantar of right hind paw to induce pain 30 min after the oral administration of essential oils (250, 500mg/kg), indomethacin (10mg/kg) and 1% CMC. The neurogenic and inflammatory responses were evaluated. Essential oils of *C. rotundus* were found to inhibit both neurogenic and inflammatory pain at higher dose, whereas at lower dose only inflammatory pain was inhibited. This shows that essential oils of *C. rotundus* have analgesic activity (27).
- The petroleum ether extract of *C. rotundus* was reported to possess analgesic activity (28).
- Aqueous, ethyl acetate, methanol and total oligomers flavonoid-enriched extracts of *C. rotundus* (300, 150, and 50μg/ml) were evaluated for their analgesic and anti-inflammatory activities in mice. The tested extracts were able to decrease the mouse ear oedema induced by xylene and reduced the number of abdominal contractions caused by acetic acid, revealing the peripheral analgesic activity of these extracts. No toxicity was recorded in mice treated with doses up to 300mg/kg b.w. (29).
- Cyperaflavoside (myricetin 3,3',5'-trimethyl ether 7-*O*-β-D-glucopyranoside), vitexin, orientin, cinaroside, quercetin 3-*O*-β-D-glucopyranoside, and myrcetin 3-*O*-β-D-glucopyranoside were assessed for their 5- lipoxygenase inhibitory potential. All compounds possessed 5-lipoxygenase inhibitory. The results supported the traditional uses of *C. rotundus* in treating inflammation and its related symptoms (16).
- The analgesic and anti-inflammatory activities of methanol, chloroform and ethyl acetate extracts of *C. rotundus* were investigated. All the extract displayed significant analgesic effect in acetic acid and hot plate pain models in a dose dependent manner. The ethyl acetate extract (500mg/kg) was the most effective in the analgesic test and it showed significantly inhibiting pain. Similarly, carrageenan-induced paw volume was significantly reduced by ethyl acetate extract (500mg/kg) (30).
- The alcoholic extract of *C. rotundus* showed significant (p<0.001) antipyretic activity against pyrexia induced in rats by the subcutaneous injection of suspension of dried Brewer's yeast in gum acacia in normal saline (31).

- The sedative-hypnotic and antidepressant effect of the methanolic extract of *C. rotundus* were evaluated. The sedative and hypnotic activity were studied performing hole board and open field tests in albino mice model at the doses of 100 and 200mg/kg body weight of the extract. Diazepam at the dose of 1mg/kg was utilized as a standard drug in both experiments. Similarly, antidepressant activity test was also performed using forced swimming test and tail suspension test. The study suggested that the plant extract do not possess notable sedative-hypnotic and antidepressant or neurobehavioral properties (32).
- The gastroprotective effect of the methanolic extract of *C. rotundus* rhizome was studied. Damage of gastric mucosa was induced by ischemia and reperfusion in male Wister albino rats. The extract was given at the dose of 100 and 200 mg/kg. The rats treated with the extracts were subjected to 30-min ischemia followed by 60-min reperfusion. The mean ulcer index of *C. rotundus* extract treated rats were significantly lower than that of control rats. The increased antioxidant activity of GSH-Px and decreased MDA levels were found in the *C. rotundus* rhizome extract treated rats when compared to the decreased antioxidant activity in untreated rats. The results showed that the *C. rotundus* extract has a profound gastroprotective effect against the gastric mucosal damage (33).
- The rhizome of *C. rotundus* was assessed for its cytoprotective effects against ethanol induced gastric damage. Decoctions of Rhizoma Cyperi were given orally (1.25, 2.5, 4.0g crude drug/kg) to rats 30 min before ethanol (40% v/v, 10mL/kg) was administered. The decoction showed an ulcer inhibitory effect in a dose dependent manner. Moreover, the activity was also observed when the decoction was given subcutaneously (0.3-0.6g/kg), suggesting that the herb possessed systemic effects on protecting the stomach. Compared with controls, gastric motility of the ethanol-treated rats was delayed significantly by either oral (2.5-4.0 g/kg) or subcutaneous (0.3g/kg) administration of the decoction. Pretreatment of rats with indomethacin (5 mg/kg) significantly reduced the gastric protective action of *C. rotundus* (34).
- The ulcer-preventive role of *C. rotundus* was studied in rats treated with non-steroidal anti-inflammatory drugs. Oral administration of different doses of *C. rotundus* rhizome methanolic extract (250 and 500mg/kg) significantly inhibited aspirin-induced gastric ulceration in animals in a dose-dependent manner (49.32% and 53.15%, respectively), which was also comparable with the standard gastric ulcer drug ranitidine. Administration of *C. rotundus* rhizome methanolic extract also significantly increased the activity of superoxide dismutase, cellular glutathione and glutathione peroxidase, and inhibited the lipid peroxidation in the gastric mucosa of ulcerated animals in a dose-dependent manner (35).
- The assessment of anti-inflammatory, antiulcer and neuropharmacological activities of the ethanolic extract of *C. rotundus* was evaluated. In experimental design, inflammation was produced by carrageenan in rats and compared with

saline treated and Aspirin treated group. The plant exhibited significant property to act as an anti- inflammatory agent. Simultaneously, the drug was also observed for its antiulcer response and found effective enough. These two activities were observed at the dosage of 300mg/kg and 500mg/kg of *C. rotundus* ethanolic extract. The anti-ulcer activity was observed (41.2% inhibition) at a dosage of 500mg/kg. Neuropharmacological activities were also observed at 300 and 500mg/kg of *C. rotundus* extract. The ethanolic extract showed mild decreased in all test and exhibited slight muscle relaxant effect (36).

- The effects of *C. rotundus* tuber extract on the microorganisms of the urinary tract infection were investigated. Ethanol extracts of the tuber was prepared by maceration. Antimicrobial effect of these extracts on the isolated strains was determined by disk diffusion and broth microdilution methods. Results revealed a growth inhibitory concentration greater than 0.5mg/ml of the ethanol extract on all the examined microorganisms of the urinary tract infection. It was thus concluded that the plant has a significant antimicrobial property with a potentially important role in the treatment of the urinary tract infection (37).
- The *in vitro* anthelmintic activity of methanolic extract of *C. rotundus* leaves at two different concentrations was studied (20, 50mg/ml). The extract was taken for anthelmintic activity against Indian earthworm *Pheretima posthuma*. The results were expressed in terms of time required for paralysis and death of *Pheretima posthuma*. Albendazole was used as a standard control group. The plant extract showed the significant activity at higher concentrations when compared to a standard control group (Albendazole) (38).
- The effect of hydroalcoholic extract of *C. rotundus* rhizomes in nephrolithiatic male Sprague Dawley rats was evaluated. The results showed that test extract has significant antilithiatic effect in terms of solute balance, reduction in crystal numbers and improvement in renal cell derangement (39).
- The behavioral studies on mice indicated CNS depressant activity of the ethanol extract of *C. rotundus* was evaluated. The ethanol extract of *C. rotundus* significantly potentiated the sleeping time of mice induced by standard hypnotics (pentobarbitone sodium, diazepam and meprobamate) in a dose dependent manner (40).

16. Additional information

- The antiplatelet activities the ethanolic extract of *C. rotundus* and eight of its constituent compounds were evaluated by examining their effects on rat platelet aggregations *in vitro* and *ex vivo*, and on mice tail bleeding times. The extract showed significant and concentration dependent inhibitory effects on collagen-, thrombin-, and/or arachidonic acid (AA)-induced platelet aggregation prolonged bleeding times. *C. rotundus* can also improve all hemorrheological indexes, such as

the whole blood specific viscosity, the plasma specific viscosity, erythrocyte electrophoresis, *etc.* (41).

- The antidiabetic activity of hydro-ethanolic extract of *C. rotundus* rhizomes in alloxan induced diabetes in rats was carried out. Oral daily administration of 500 mg/kg of the extract (once a day for seven consecutive days) significantly lowered the blood glucose levels. This antihyperglycemic activity can be attributed to its antioxidant activity as it showed the strong DPPH radical scavenging action *in vitro* (42).

17. Date of compilation/last revision

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